LWG
LOWER WILLAMETTE GROUP

Memorandum

To: Eric Blischke and Chip Humphrey, EPA Region 10

From: Lower Willamette Group (LWG)

CC:

Date: February 27, 2009

Re: Work Plan Remedial Action Objectives (RAOs) Revision and Potential New "Management Goals" for Portland Harbor Site

This memo contains additional details on RAO revisions and potential new "Management Goals" that were discussed at the February 9, 2009 EPA/LWG meeting on RAOs. Note the term "Management Goals" is in quotes to indicate that final terminology for these items has not yet been agreed to as discussed more below.

This document is organized to address the two issues discussed in the meeting that LWG indicated it would reply to EPA on 1) additional details on Work Plan RAOs and 2) potential approaches for two specific "management goals" that were discussed during the meeting: an ecological TZW "management goal" and recontamination "management goals". It should be recognized that these two types of goals overlap and are inter-related in several respects.

1. Work Plan RAOs EPA Requested Revisions

The Preliminary RAOs were established in the Programmatic Work Plan for the Portland Harbor RI/FS (Work Plan - April 2004). EPA requested that specific receptors and scenarios should be added to these RAOs. It is the LWG position that the Work Plan RAOs represent our current understanding of the correct set of RAOs to be used in the FS (pending the outcome of the risk assessments) and that they generally reflect the right level of detail, although supporting text that describes these RAOs will also be needed as discussed more below. Thus, we propose the following RAOs for use in the FS:

1. Reduce human health risks from direct contact with and incidental ingestion of chemicals of concern (COCs) in sediment in the site to acceptable levels.

2. Reduce COC concentrations in sediments in the site to levels that will result in acceptable risks to humans that eat fish and shellfish from the site.

3. Reduce human health risks from direct contact with and incidental ingestion of COCs in water at the site to acceptable levels.

4. Reduce ecological risks from contact with and ingestion of COCs in sediments or prey in the site to acceptable levels.

5. Reduce ecological risks from contact with and ingestion of COCs in water in the site to acceptable levels.

RAOs of this type and level of detail are similar to the approach used for most other large sediment sites right through to the ROD (e.g., Fox and Hudson River RODs).

It would be beneficial to elaborate on the receptors and scenarios included under each RAO in supporting text in the RAOs section of the FS. Our suggestion for this supporting text is as follows:

1. Reduce human health risks from direct contact with and incidental ingestion of chemicals of concern (COCs) in beach sediment in the site to acceptable levels for recreational, transient, fisher, and worker uses and in-water sediment for fisher, worker, and diver uses.

2. Reduce COC concentrations in sediments in the site to levels that will result in acceptable risks to humans that eat fish and shellfish from the site.

3. Reduce human health risks from direct contact with and incidental ingestion of COCs in water at the site to acceptable levels for recreational, transient, and diver uses.

4. Reduce ecological risks from contact with and ingestion of COCs in sediments or prey in the site to acceptable levels for the following receptors:

- Benthic invertebrates including bivalves and decapods
- Resident or migratory fishes
- Aquatic dependent birds
- Aquatic dependent mammals

5. Reduce ecological risks from contact with and ingestion of COCs in water in the Site to acceptable levels for the following receptors:
   - Benthic invertebrates including bivalves and decapods
   - Resident or migratory fishes
   - Aquatic dependent birds
   - Aquatic dependent carnivorous mammals.

We expect that supporting text would also include specific definitions and clarifying details in general such as defining the sediments to which there may be exposures per the risk assessment conceptual site model. In addition, consistent with guidance, RAOs are refined throughout the RI/FS. Thus, these RAOs and supporting text will need to be revised consistent with the findings of the risk assessment and such refinements may result in revisions to, removal of, or addition of RAOs.

2. Potential New "Management Goals"

As noted above, EPA and LWG could not agree on an exact terminology for any new "management goals". It was discussed conceptually that some type of narrative, and if possible, numeric goals could be developed for the site as it relates to:

- Protection of ecological receptors from exposures to transition zone water (TZW) impacted by groundwater plumes
- Potential recontamination to river sediments and water from stormwater and groundwater.

EPA indicated they would prefer that these be expressed as RAOs for the FS, which would then be developed into specific Preliminary Remediation Goals (PRGs). The LWG indicated that both issues relate to the control of sources, which will not be assessed in the FS, and therefore,

these should be termed "source control management goals" or some similar phrase, but not RAOs for the FS.

We would like to further clarify that we do not think that such goals should be developed by the LWG or used in the FS and point out that they are not part of the Scope of Work for performance of the RI/FS. [1] We also believe it is necessary to address source related goals in the context of the specific issues of the sources and conceptual site model associated with each individual site. Consequently, any application of generalized harbor-wide goals to decisions about actual and particular upland sites should allow for a broad range of flexibility. This concept is consistent with Joint Source Control Strategy weight of evidence approaches, which allow for many types of evaluations to determine source control status and control.

We understand that such goals would be useful to EPA and DEQ for assessment of sources and definition of source controls from upland and upriver sources to the river. Consequently, we propose that these management goals be developed by DEQ and/or EPA using site information. Below is a general description of methods that DEQ and EPA might use to develop such source management goals. These are consistent with in-river risk assessments and development of related in-water PRGs currently being conducted by LWG.

Ecological TZW Management Goals

TZW goals to protect ecological exposures should be focused only on areas of known groundwater discharge plumes and their associated volatile chemicals. Such an approach is consistent with the agreements noted in the May 14, 2008 resolution table, where EPA agreed that the LWG would not need to estimate TZW concentrations and compare those to Ambient

[1] Section 7.4 of the Scope of Work provides as follows: "Respondents will identify source areas that are contributing to contamination to the in-water portion of the Site. Although DEQ is primarily responsible for the control of upland contaminant sources to the Site, as part of the RI/FS, Respondents shall evaluate the distributions of sediment contaminants and, if appropriate (e.g., if the sediment data suggests the presence of an ongoing source), make recommendations to EPA and DEQ if the need for further investigation or control of sources is identified.

Water Quality Criteria (AWQC) in areas of the river outside groundwater plume discharge areas. Such goals could be used to evaluate against potential in-river impacts associated with upland groundwater sources per DEQ direction to individual parties. In this context, there may be different ways to approach this on a site-specific basis, including:

1. Determining whether bulk sediment PRGs are sufficient to protect ecological exposures at that particular site;
2. Stating a surface water goal to apply in an area of a groundwater plume:
   - For volatile chemicals present in the groundwater plume
   - AWQC for direct toxicity as the stated goals
   - Allowing for site-specific determinations as to how such surface water goal would be achieved and measured (e.g., based on attenuation modeling, measured at a point of compliance in the surface water)
3. Stating a TZW goal to apply in an area of a groundwater plume:
   - For volatile chemicals present in the groundwater plume
   - AWQC for direct toxicity, where applicable, or other toxicity values as the basis for the goals
   - Using modifying factors that account for actual exposure of benthic organisms to TZW.
   - Including a provision that bioassays can be used to directly evaluate TZW toxicity and would have precedence over any numeric goals
   - Including the express understanding that the goals should be applied only to TZW and not to deeper groundwater or groundwater along the shoreline because attenuation of these plumes may occur before they are expressed to TZW.

Goals for surface water and TZW should focus on volatile chemicals, because other chemicals are fully assessed by sediment risk assessment methods and would be best addressed through the first option (e.g., bulk sediment PRGs).

Bioaccumulation water quality criteria for bioaccumulative chemicals should not be included in the ecological TZW goals, because bioaccumulation issues are being directly addressed through

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EPA and DEQ will utilize this information in making source control adequacy determinations. Because upland sites represent many of the known contaminant sources, coordination with upland investigations and DEQ source control efforts will be required."

sediment PRGs. This is consistent with the fact that bioaccumulative chemicals are highly sorbed to sediment organic carbon and not generally associated with dissolved phase groundwater plumes.

More information can be provided by the LWG on the determination of modifying factors, if that would assist DEQ and EPA in goal development. EPA previously rejected modifying factors for TZW screening in the context of the risk assessment, and LWG agreed to this for screening purposes because this was a reasonable approach for a conservative screening step. Because management goals would be applied in the context of source controls, where risk management factors enter into the evaluation, these modifying factors are needed to achieve balanced and reasonable goals that reflect the actual exposures of the organisms being protected.

Recontamination Management Goals

The methodology for establishing TZW goals described above could be one element that is included in an overall set of source control or recontamination management goals. Additional recontamination management goals could include sediment and surface water metrics that allow for assessment of potential recontamination from stormwater, groundwater (via the TZW pathway), and/or upstream in-river surface water, if this is possible given the level of information available. There is generally insufficient information with which to quantify other types of sources (e.g., bank erosion), except possibly on a narrative basis.

The LWG evaluation of recontamination in the FS will provide considerable information on the ranges of stormwater loads that that may result in recontamination of sediments at various potential levels. Groundwater goals could be developed to be applied to TZW in the biologically active surface sediments, which is the analogous point of discharge for groundwater. Both types of goals should be back calculated from values that are consistent with in-river sediment and surface water PRGs that are derived from the RAOs noted in the beginning of this memo. Because a very wide range of PRGs will be initially available, the determination of recontamination management goals cannot be reasonably determined until EPA makes some risk management decisions and selects a subset of in-river PRGs for use in development of recontamination management goals.

Stormwater goals for system loads that are protective of sediment and surface water could be determined by back calculating stormwater loads from the sediment and surface water PRGs. This could be accomplished through the use of the river fate and transport models (e.g., Abiotic Fate and Transport (AFT) model or other similar versions of such models currently available from Bruce Hope of DEQ). However, the uncertainty of any models should be fully evaluated to determine if they can adequately meet this objective before they are used. Such models could be run iteratively with ranges of stormwater load inputs until long term outcomes that are approximately equal to sediment and water PRGs are identified. The stormwater goals could be expressed in terms of a total load that meets both sediment and water PRGs on a site-wide basis.

Groundwater/TZW goals that are protective of surface water and sediment PRGs based on the above RAOs could be calculated for TZW in terms of concentration. As described in the previous section, one TZW goal could be expressed in terms of site-specific concentration values that are protective of ecological exposures. As described previously, TZW goals should be applied to areas of "discharge" exactly analogous to stormwater discharges, and thus, should only apply to areas where groundwater plumes enter the river and to volatile chemicals in those plumes.

TZW goals should be expressed in terms of concentration in TZW (not in terms of load like stormwater). This is appropriate for four reasons. One, groundwater plumes are related to specific upland chemical sources, and multiple groundwater discharges are not often contributing to loading of the same chemical on a site-wide basis. Two, the AFT model is the most readily available tool for such a loading assessment, and the AFT model is currently set up for a list of chemicals that does not include most of the chemicals that would be expected to be of interest in groundwater plumes. Three, empirical loading estimates that will be presented in the RI indicate that groundwater plume contribution to overall site loading of most chemicals is relatively minor. Four, TZW goals that are based on meeting sediment and water PRGs on a concentration basis would be expected to greatly reduce the overall potential loading of groundwater chemicals to the river.

As noted previously, TZW goals should be applied only to TZW and not to deeper groundwater or groundwater along the shoreline because attenuation of these plumes may

occur before they are expressed to TZW. If such extrapolation to shoreline conditions is needed for a particular site, for example to allow for logistically simpler shoreline sampling, DEQ working with the site owner would need to determine the appropriate modifying factors which include mechanisms such as attenuation and dilution that occur between the shoreline and the actual TZW.

Three possible types of TZW goals are:

1. An ecological TZW goal that is back calculated from AWQCs using modifying factors related to benthic exposure, as described in the previous section. This goal is intended to protect benthos in TZW itself from groundwater discharges.
2. A TZW monitoring point goal for achievement of surface water PRGs that is back calculated from surface water PRGs using modifying factors for mixing and integration of groundwater upon discharge to the water column. This goal is intended to protect against exceeding surface water PRGs in the water column due to groundwater discharges.
3. A TZW goal that is back calculated from sediment PRGs using equilibrium partitioning assumptions. This goal is intended to protect against exceeding sediment PRGs in the biologically active zone of the sediment due to groundwater discharges.

As noted previously, these goals would not be used in the FS evaluation. Rather, in the FS the ability of various remedial alternatives to protect against potential exposures would be evaluated directly through sediment and surface water PRGs that are an outgrowth of the RAOs presented previously.

The ecological TZW goal estimate is described above.

The TZW goal for protection of surface water PRGs could be estimated using simple water mixing models using river flow/velocity information as well as the groundwater discharge rate and TZW concentrations measured or estimated for each groundwater plume. A range of river flow conditions could be modeled and a reasonably conservative set of conditions could be used to set the TZW goals.

Surface water quality criteria or PRGs based on bioaccumulation should not be included in the surface water TZW goal, because bioaccumulation issues are being directly addressed through sediment PRGs. This is consistent with the fact that bioaccumulative chemicals are highly sorbed to sediment organic carbon and not generally associated with dissolved phase groundwater plumes. Further, bioaccumulation occurs over the ranges that fish and other species are exposed. Consequently, application of site-wide bioaccumulation PRGs to specific groundwater discharge plumes would be inconsistent with these site-wide exposure assumptions.

The TZW goal for protection of sediment PRGs could be estimated using equilibrium partitioning assumptions, which provide a conservative estimate of sediment concentrations, given that groundwater plumes are generally in disequilibrium. Bioaccumulation PRGs should not be included in the sediment TZW goal for the same reasons noted in the previous paragraph.

As noted above, all TZW goals should include the following considerations:

- Ecological and surface water TZW goals should be applied only to volatile chemicals present in groundwater plumes
- The goals should only be applied in areas of groundwater plumes
- Direct measures of risk should have precedence over any numeric TZW goals including: bioassays to evaluate TZW toxicity, surface water sampling concentrations to evaluate attainment of surface water PRGs, and sediment sampling concentrations to evaluate attainment of numeric sediment PRGs.
- The goals should be applied only to TZW and not to deeper groundwater or groundwater along the shoreline because attenuation of these plumes may occur before they are expressed to TZW.

Upstream Surface Water Goals could be determined in a manner analogous to the method described for stormwater goals. Both types of sources cause inputs to site surface water that can have a potential impact on site surface sediment chemical concentrations over time. Thus, upstream input loads that prevent unacceptable levels of sediment recontamination (in combination with stormwater loads) could be determined.